

NON-PUBLIC?: N  
ACCESSION #: 9506200350  
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Clinton Power Station PAGE: 1 OF 4

DOCKET NUMBER: 05000461

TITLE: Fault in Reactor Recirculation Control Circuitry Causes  
Pumps to Trip from Fast to Slow, Operation in the  
Restricted Zone and Manual SCRAM  
EVENT DATE: 05/15/95 LER #: 95-005-00 REPORT DATE: 06/13/95

OTHER FACILITIES INVOLVED: None DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR  
SECTION:  
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:  
NAME: Bill Sanders, Plant Engineer TELEPHONE: (217) 935-8881,  
Extension 4071

COMPONENT FAILURE DESCRIPTION:  
CAUSE: B SYSTEM: AD COMPONENT: BU MANUFACTURER: F180  
REPORTABLE NPRDS: Y

SUPPLEMENTAL REPORT EXPECTED: NO

#### ABSTRACT:

On May 15, 1995, the plant was in POWER OPERATION at about 100% reactor power. Operators were adjusting reactor core flow using the "B" reactor recirculation flow control valve when the hydraulic power unit locked up, which hydraulically locks the flow control valve, and both reactor recirculation pumps tripped from fast to slow speed. The reduction in core flow caused the plant to enter the restricted zone of the thermal power versus core flow operating map. Plant procedures required the operators to initiate a manual SCRAM when the restricted zone was entered. The cause of the hydraulic power unit locking up and the pump trip from fast to slow speed was a fault in one of the reactor recirculation control panel +/- 15 volt Direct Current (DC) field bus bars. This fault created a false indication of low differential temperature between the steam dome and reactor recirculation pump suction

which causes the pumps to trip from fast to slow speed following a time delay. The fault was due to a protrusion or "spur" on the +/- 15 volt DC bus bar. The "spur" was created during the manufacturing process and propagated through the insulating paper from the - 15 volt DC portion of the field bus and shorted with the + 15 volt DC portion of the bus bar. The nest assembly, which contained the faulty field bus bar, was replaced with a spare nest assembly.

END OF ABSTRACT

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#### DESCRIPTION OF EVENT

On May 15, 1995, at about 1636 hours, the plant was in Mode 1 (POWER OPERATION) and at about one hundred percent reactor RCT! power. Operators began adjusting reactor power using the "B" reactor recirculation system AD! flow control valve FCV! when the hydraulic power unit locked up which hydraulically locks the flow control valve. The "B" reactor recirculation system flow control valve was locked in its last position. About 16 seconds after the flow control valve hydraulic power unit locked up, both reactor recirculation pumps P! tripped from fast to slow speed causing a significant reduction in reactor core flow.

At about 1637 hours the reactor operator recognized that the reduction in reactor core flow had caused the reactor to operate in the restricted zone of the thermal power versus core flow operating map. The reactor operator immediately initiated a manual SCRAM by placing the reactor mode switch HS! in the shutdown position as required by CPS No. 4008.01, "Loss of Reactor Coolant Flow." As reactor water level decreased to the low reactor water level (Level 3) trip setpoint, containment isolation valves in Groups 2 (Residual Heat Removal BO! to upper containment pools), 3 (Residual Heat Removal shutdown cooling), and 20 (miscellaneous) automatically closed or were already closed as designed. When Reactor water level began increasing the operators manually tripped the "A" turbine TRB! driven reactor feedwater (TDRFP) SJ! pump. Reactor water level reached the low level (Level 4) alarm ALM! trip setpoint causing the "A" reactor recirculation flow control valve to automatically runback due to the tripped "A" TDRFP. The "B" reactor recirculation flow control valve did not respond because the hydraulic power unit was locked up. Reactor water level recovered reaching the high water level (Level 8) trip setpoint which automatically tripped the "B" turbine driven reactor feedwater pump and the main turbine. The turbine bypass valves V! opened to control reactor pressure.

At about 1641 hours the reactor SCRAM signal was reset. At about 1644 hours the operators started the motor MO! driven reactor feedwater pump to control reactor water level. The plant was stabilized in Mode 3 (Hot Shutdown). Condition Report 1-95-05-040 was initiated to investigate this event.

Following the event, troubleshooting by Control and Instrumentation technicians and Nuclear Station Engineering personnel determined that the lock up of the reactor recirculation flow control valve hydraulic power unit and the trip of the reactor recirculation pumps from fast to slow speed was caused by a fault on one of the +/- 15 volt Direct Current (DC) field power bus bars for the reactor recirculation control system. The lock up of the hydraulic power unit occurred immediately at the time of the fault. The fault also created a false indication of low differential temperature between the steam dome and the reactor recirculation pump suction. This signal caused the reactor recirculation pumps cavitation interlock to trip the pumps from fast to slow speed following a 15 second time delay.

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No other automatic or manually initiated safety system responses were necessary to place the plant in a safe and stable condition. No other equipment or components were inoperable at the start of this event to the extent that their inoperable condition contributed to this event.

#### CAUSE OF THE EVENT

The cause of this event is attributed to a fault in the +/- 15 volt DC field bus bar in the control cabinet nest assembly which contains the circuit cards for the "B" portion control circuitry of the reactor recirculation system. The field bus bar is made of two copper plated bars stacked on top of one another with a piece of insulating paper between the bars to electrically isolate them. The bus bars are then roll pressed together with an outer layer of varnish and paper insulation. During plant operation one copper bar is energized to +15 volts DC, the other is energized to - 15 volts DC. The fault was apparently caused by a protrusion or "spur" on the inside face of the - 15 volt DC portion of the field bus bar that propagated through the insulating paper and eventually shorted against the +15 volt DC portion of the field bus bar. The "spur" originated during the manufacturing process. During the fifth refueling outage, which was completed on April 29, 1995, several circuit cards were removed from the nest assembly where the bus bar fault occurred. The removal of the cards may have caused the "spur" to protrude through the insulating paper to the point where sufficient current was being drawn creating an area of localized heating

on the bar. The additional heat caused further expansion and the protrusion from the - 15 volt DC portion eventually contacted the +15 volt DC portion of the field bus bar causing the fault.

#### CORRECTIVE ACTION

The nest assembly which contained the +/- 15 volt DC field bus bar, was replaced with a spare nest assembly which included a field bus bar in accordance with Maintenance Work Request D61201.

#### ANALYSIS OF THE EVENT

This event is reportable under the provisions of 10CFR50.73(a)(2)(iv) due to a manual actuation of the Reactor Protection System.

Assessment of the safety consequences of and implications of this event indicated that this event was not nuclear safety significant. This event was analyzed and found to be consistent with the analyses of Decrease in Reactor Coolant Flow Rate transients found in Chapter 15 of the Updated Safety Analysis Report. This event was found to be within the design basis of the plant. The capability of the plant to perform its intended safety functions and achieve and maintain a safe shutdown was not affected by this event.

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#### ADDITIONAL INFORMATION

The failed bus bar was part number N0310YP of a nest assembly model # 2ANU-D Style A manufactured by The Foxboro Company.

Clinton Power Station has not reported other manual SCRAMs having similar causes.

For further information regarding this event, contact W. N. Sanders, Plant Engineer, at (217) 935-8881, extension 4071.

ATTACHMENT TO 9506200350 PAGE 1 OF 1

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POWER U-602457  
L45-95(06-13)LP  
2C.220  
JGC-245-95  
June 13, 1995

Docket No. 50-461 10CFR50.73

Document Control Desk  
Nuclear Regulatory Commission  
Washington, D.C. 20555

Subject: Clinton Power Station - Unit 1  
Licensee Event Report No. 95-005-00

Dear Sir:

Enclosed is Licensee Event Report No. 95-005-00: Fault in Reactor  
Recirculation Control Circuitry Causes Pumps to Trip from Fast to Slow,  
Operation in the Restricted Zone and Manual SCRAM. This report is being  
submitted in accordance with the requirements of 10CFR50.73.

Sincerely yours,

J. G. Cook  
Vice President

MRS/csm

Enclosure

cc: NRC Clinton Licensing Project Manager  
NRC Resident Office, V-690  
Regional Administrator, Region III, USNRC  
Illinois Department of Nuclear Safety  
INPO Records Center

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